



# **Parcel C RU-C5 Fieldwork Update**

## **Sulfate Polish Decision Point**

### **Groundwater Treatability Study**

**BCT Meeting  
January 27, 2011**

**Hunters Point Naval Shipyard  
San Francisco, CA**



# **RU-C5 Groundwater Treatability Study (TS) Overview**



1. Pre-Design Characterization/Baseline Sampling
2. Treatment Component (TC) TS Design Finalization
3. **TC 1 and 3, Implementation of Hydraulic Fracturing and EHC Emplacement in Source Area and Plume**
4. **TC2: Thermal Conduction Heating**
5. **TC3: Sulfate Polish**



# Presentation Roadmap



- 1. TC 1 & 3: Hydraulic fracturing and EHC emplacement in source area and dissolved phase plume.**
  - Analytical data from 3 post-fracture monitoring events , evaluation of carbon distribution, changes in geochemistry , and COC (Chemical of Concern) degradation.**
  - Focus on Plume wells (IR25MW16A, -MW11A ,and -68A).**
  - Evaluation/decision making for polish**
- 2. TC2: Thermal conduction heating in the source area**
  - Review website**
  - Details of O&M and Performance Evaluation.**



# RU-C5 Building 134 TS Area

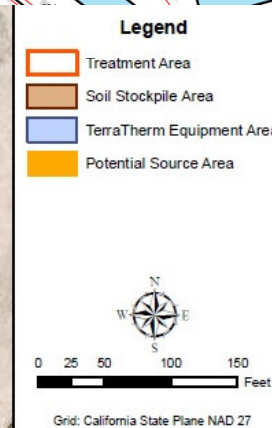
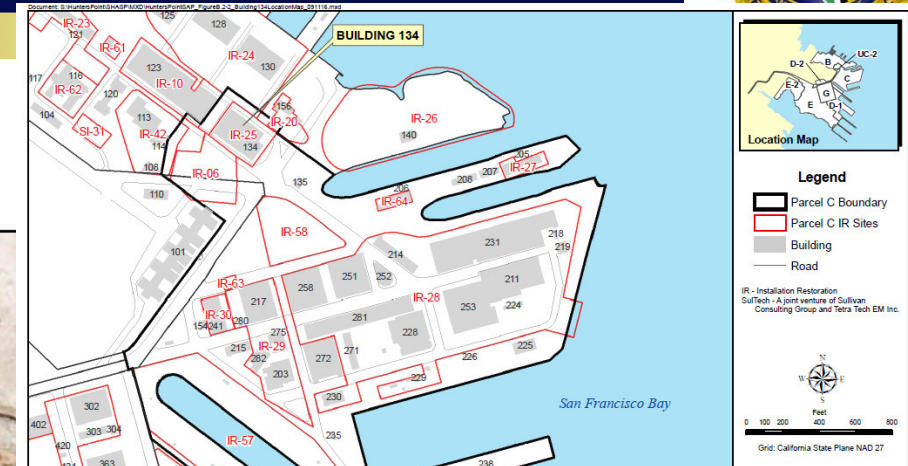


Figure 9-1  
Site Layout Map  
Hunters Point Shipyard

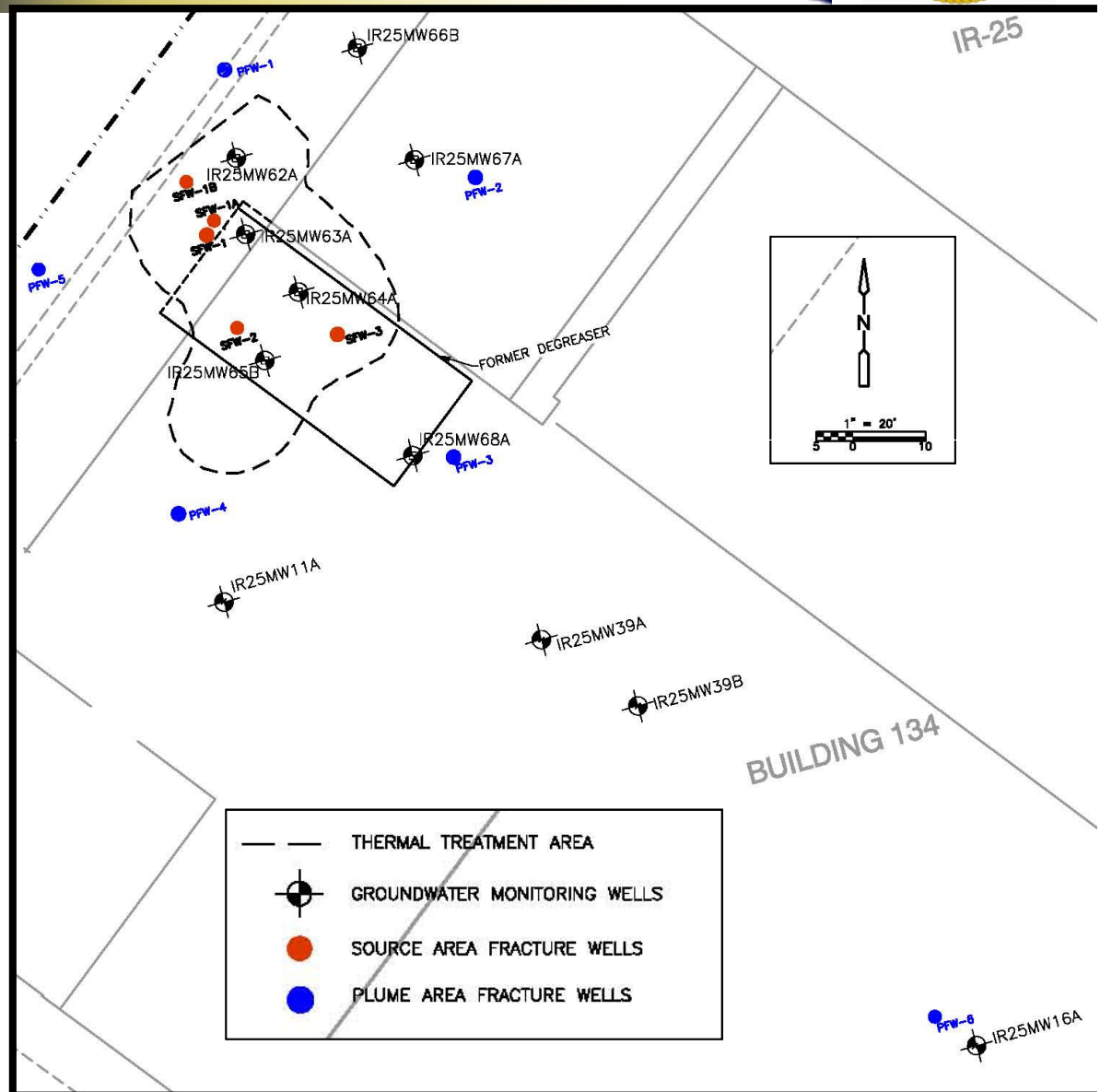


# TC1&3: Hydraulic Fracturing/EHC Emplacement



## Hydraulic Fracturing Summary:

- Completed July 2010
- Advanced 11 fracture boreholes (SFW – source frac wells and PFW- plume frac well)
- Radius of influence 15-20 feet from fracture location
- Emplaced >34,000 lbs of amendment (i.e. EHC™)
- Emplaced sand in PFW wells

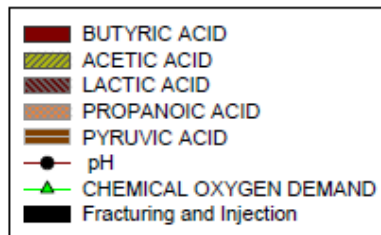
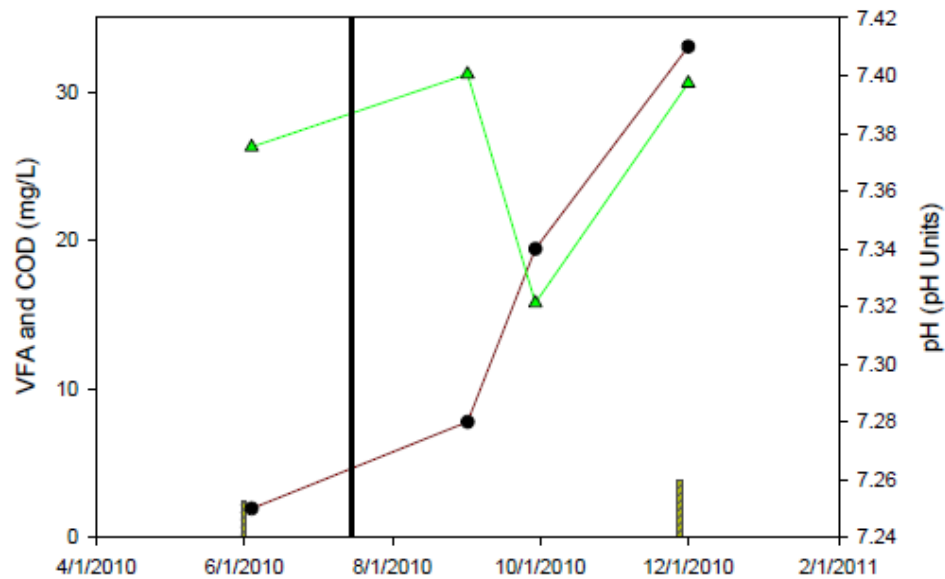




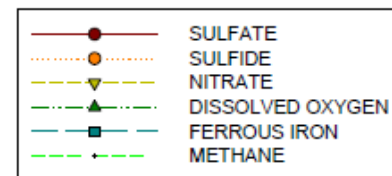
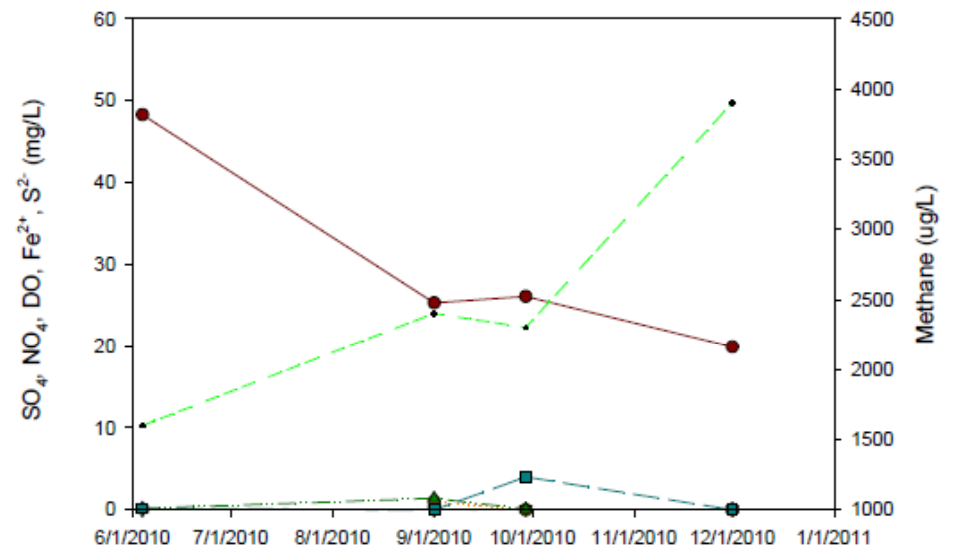
# Amendments and Redox: IR25MW11A



IR25MW11A



IR25MW11A

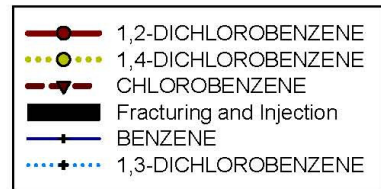
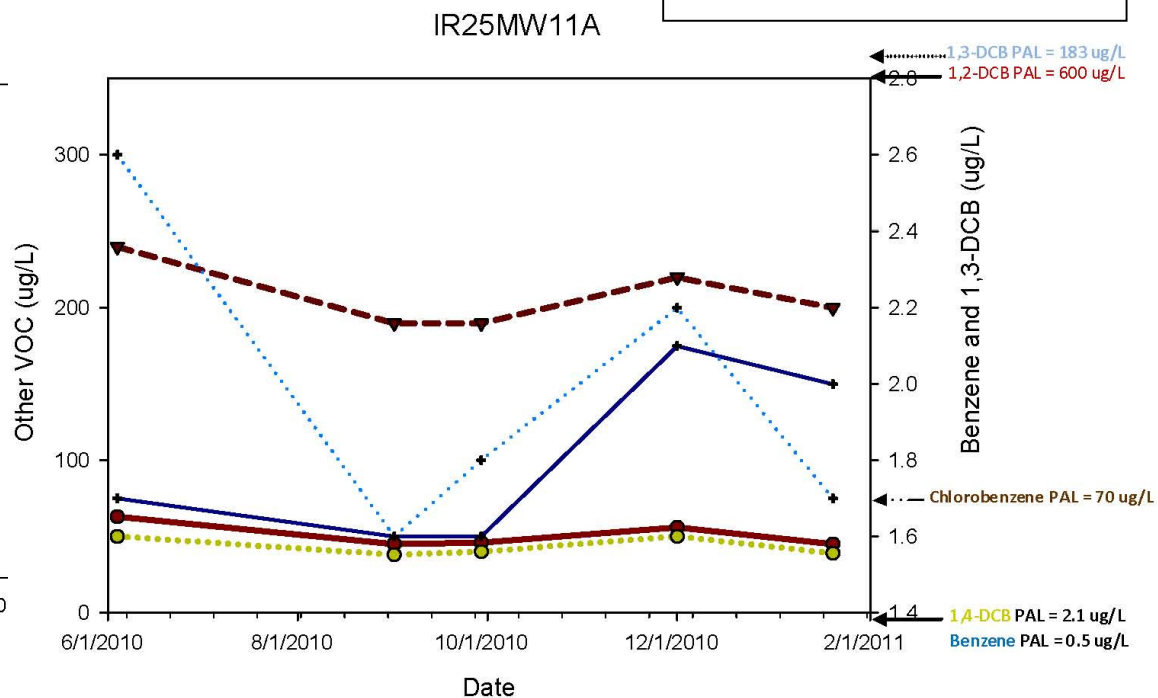
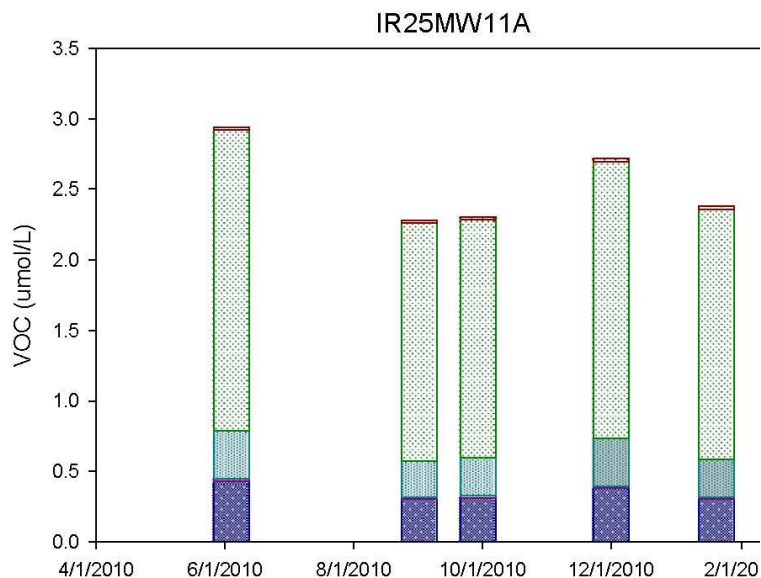




# Chlorobenzene Degradation: IR25MW11A



**CB (220 ppb), 1,4-DCB (39 ppb), and Benzene (2.0 ppb) above PALs.**



1,3-DCB PAL = 183 ug/L  
1,2-DCB PAL = 600 ug/L  
Chlorobenzene PAL = 70 ug/L  
1,4-DCB PAL = 2.1 ug/L  
Benzene PAL = 0.5 ug/L

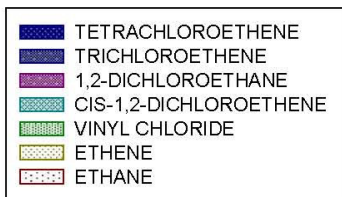
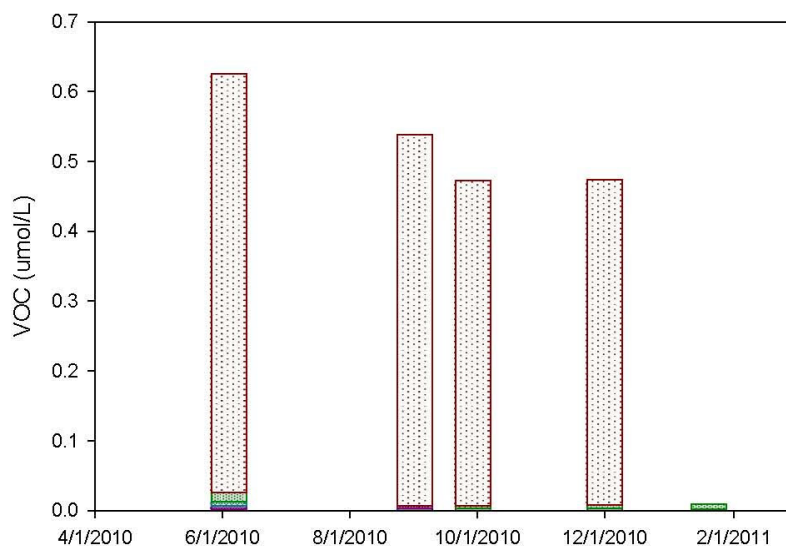


# Chloroethene Degradation: IR25MW11A

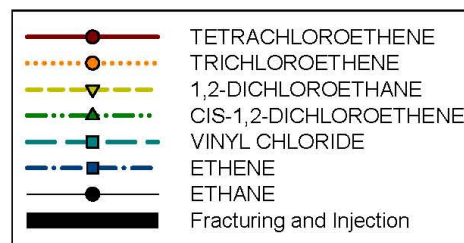
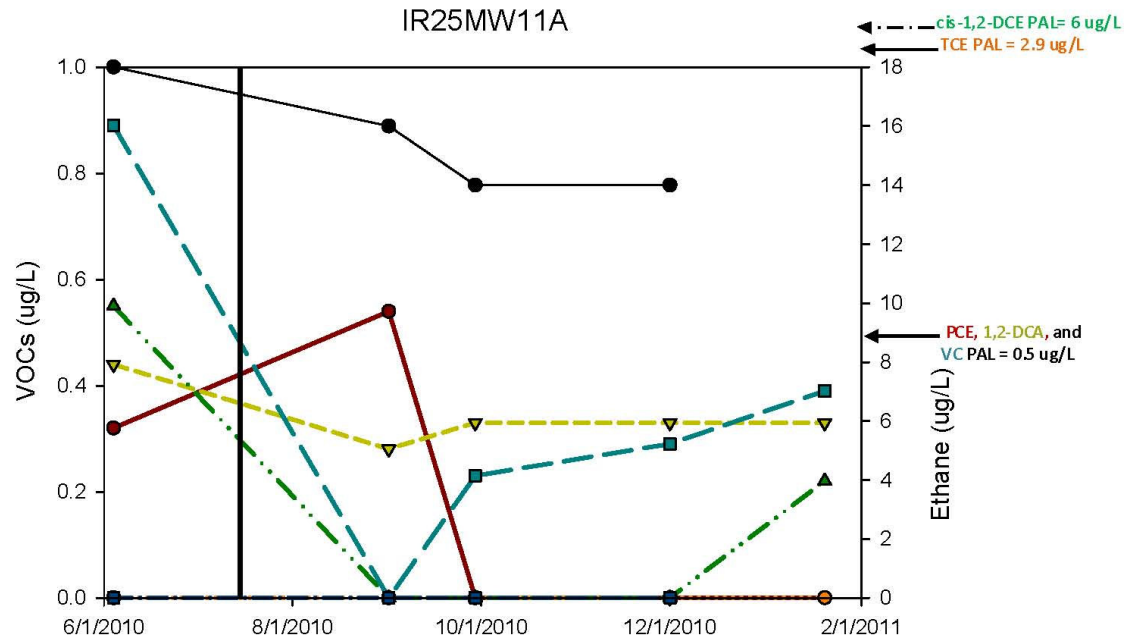


All CoC below PAL.

IR25MW11A



IR25MW11A



cis-1,2-DCE PAL = 6 ug/L  
TCE PAL = 2.9 ug/L

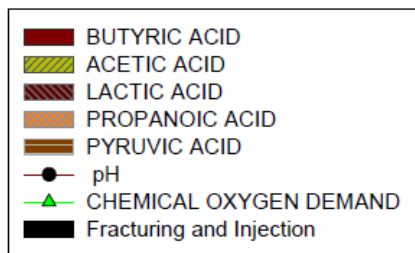
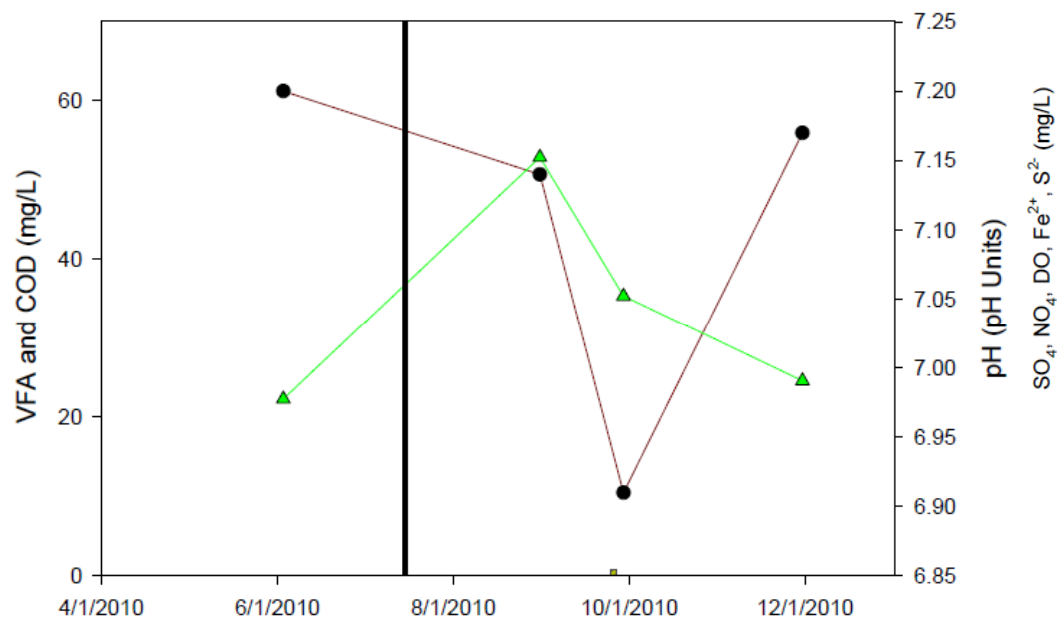
PCE, 1,2-DCA, and VC PAL = 0.5 ug/L



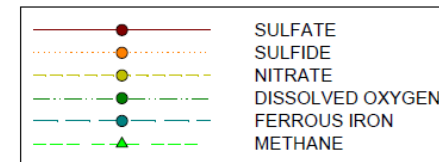
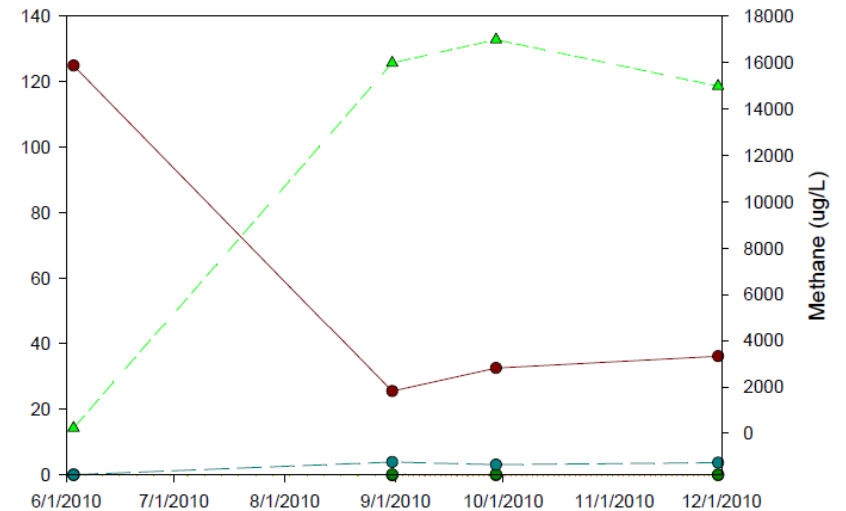
# Amendments and Redox: IR25MW68A



IR25MW68A



IR25MW68A

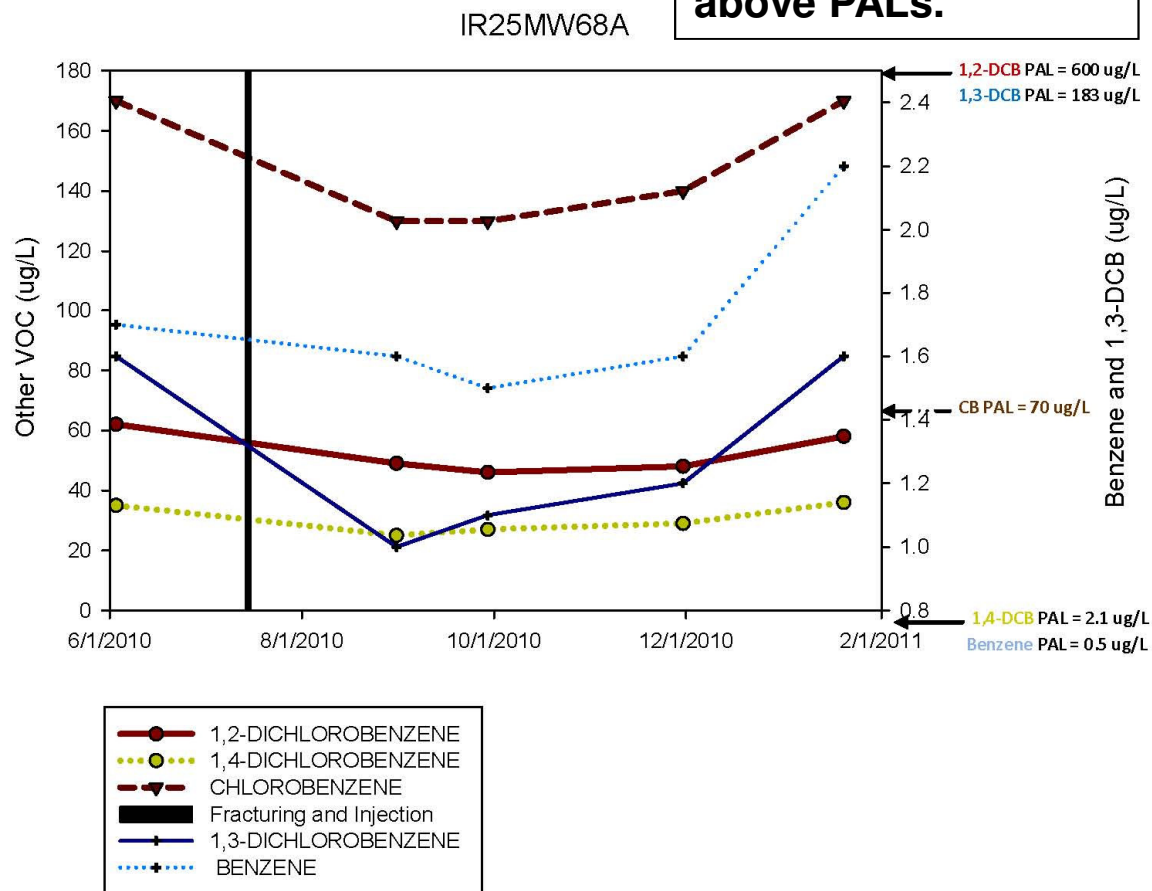
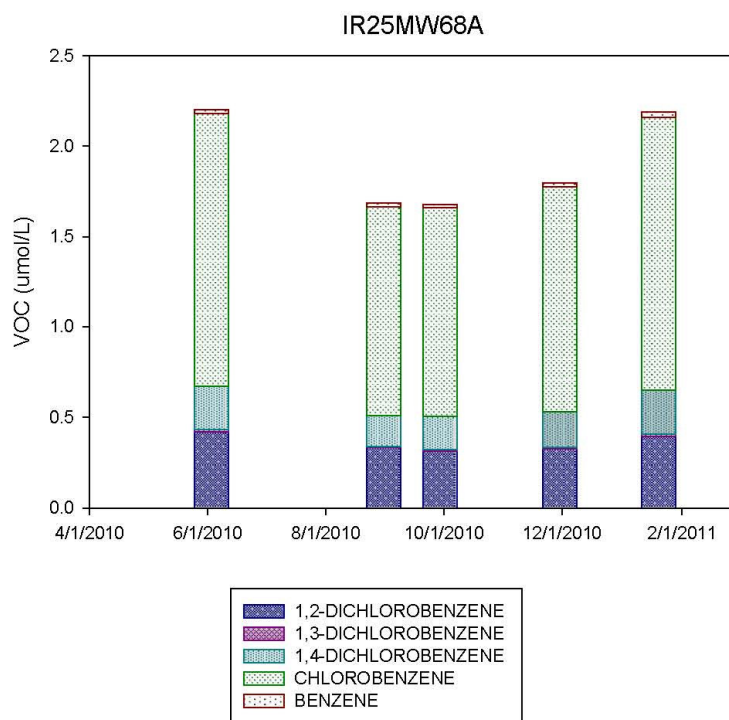




# Chlorobenzene Degradation: IR25MW68A



**CB (170 ppb), 1,4-DCB (36 ppb), and Benzene (2.2 ppb) above PALs.**

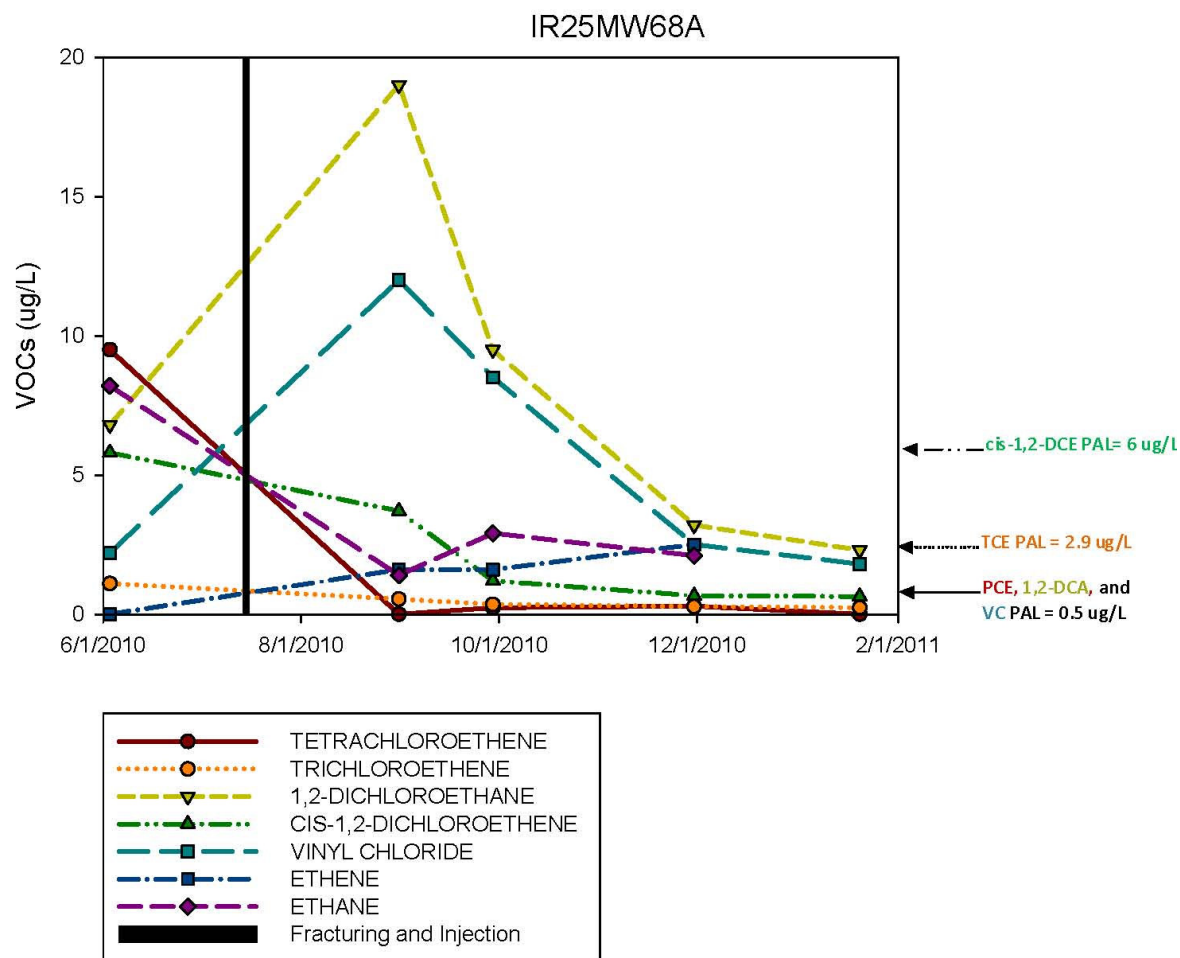
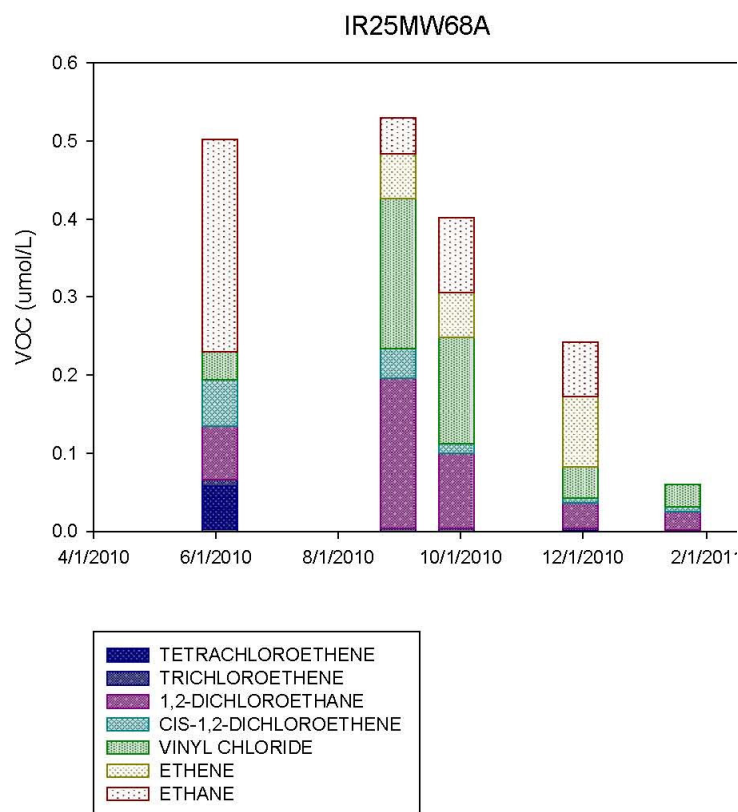




# Chloroethene Degradation: IR25MW68A



Only VC (1.8 ppb)  
and 1,2-DCA (2.3  
ppb) above PAL.

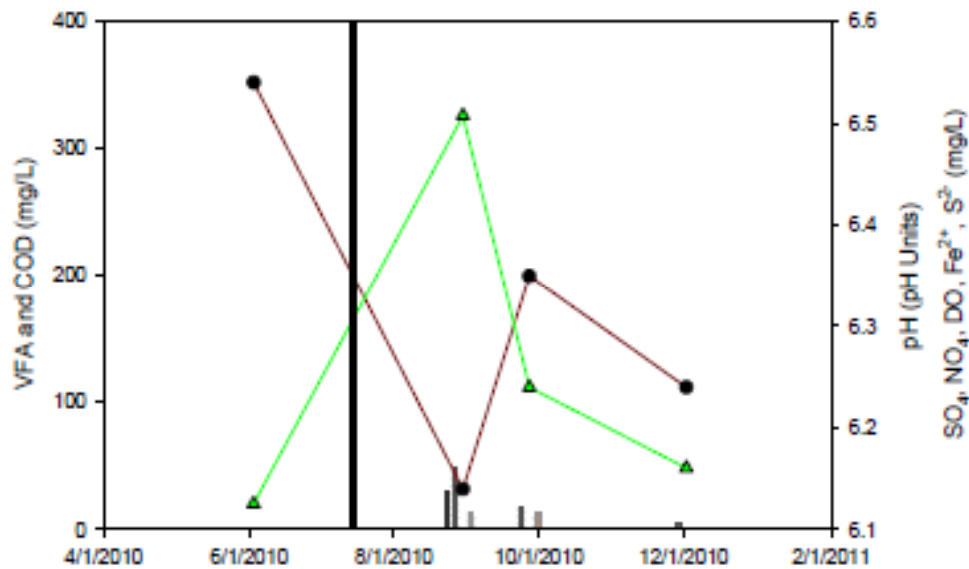




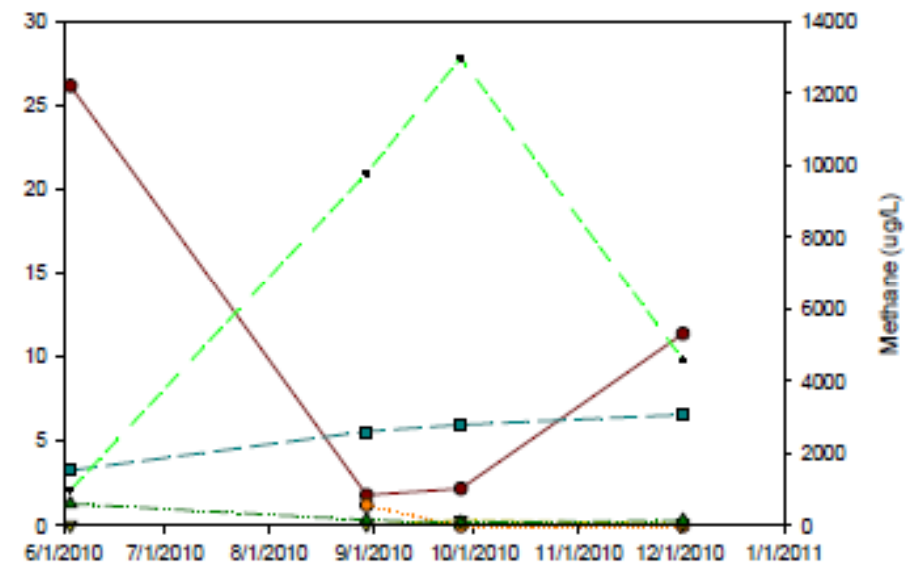
# Amendment and Redox: IR25MW16A



IR25MW16A



IR25MW16A

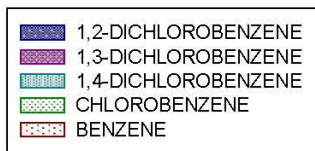
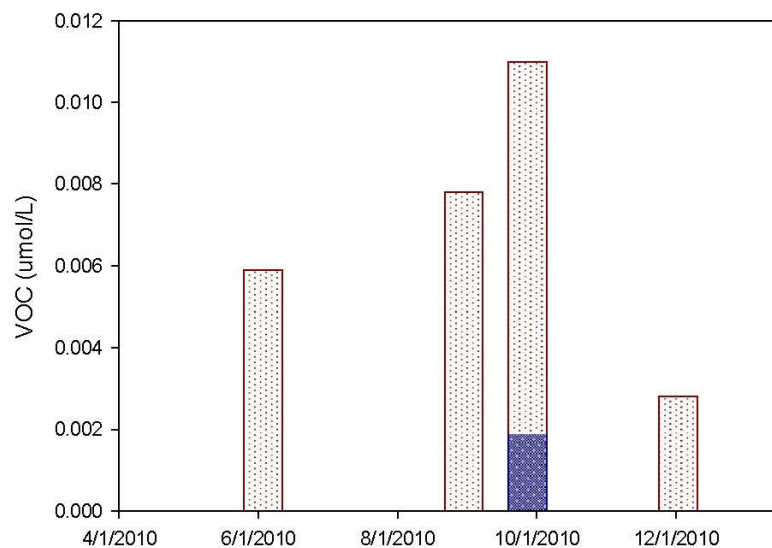




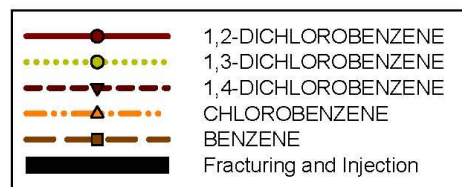
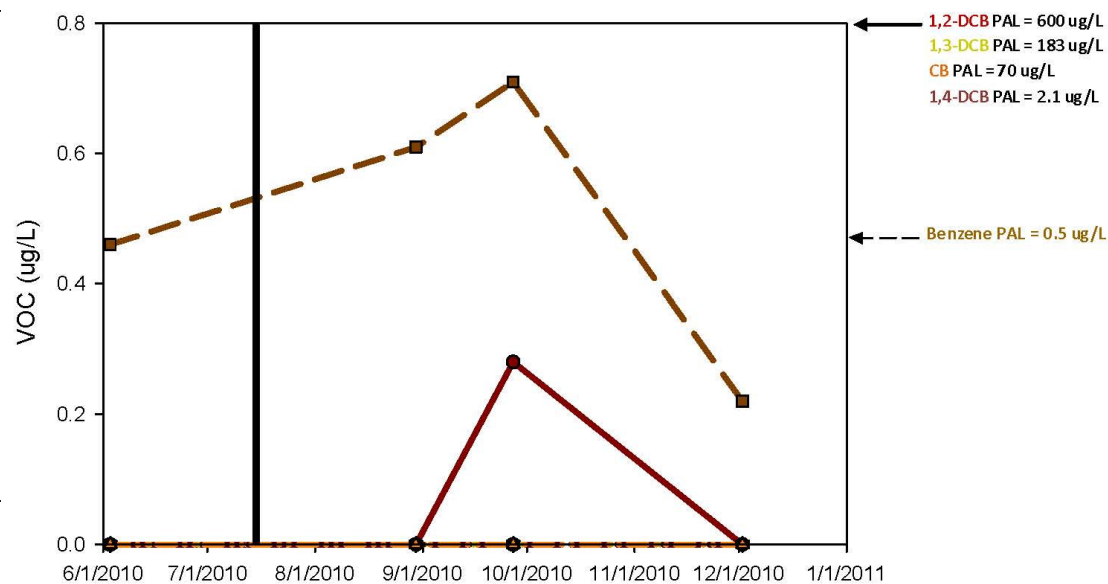
# Chlorobenzene Degradation: IR25MW16A



IR25MW16A



IR25MW16A



1,2-DCB PAL = 600 ug/L  
1,3-DCB PAL = 183 ug/L  
CB PAL = 70 ug/L  
1,4-DCB PAL = 2.1 ug/L

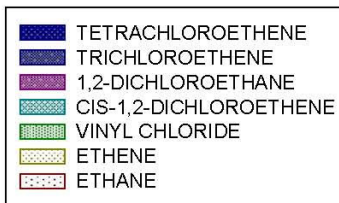
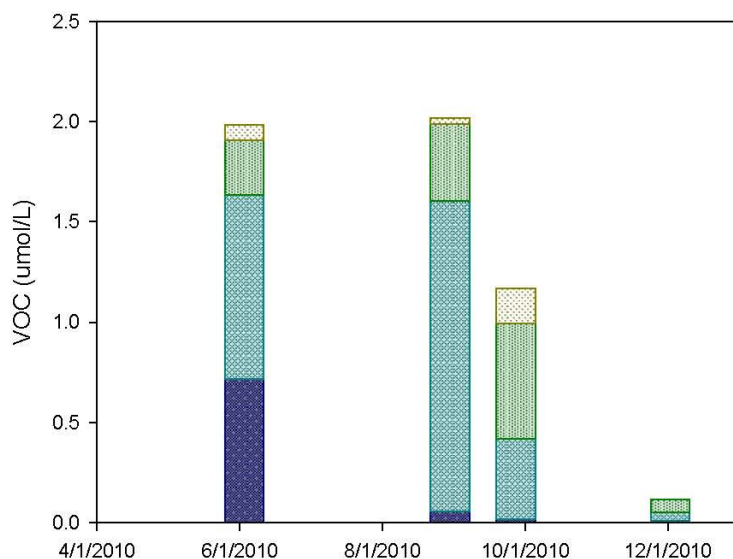
Benzene PAL = 0.5 ug/L



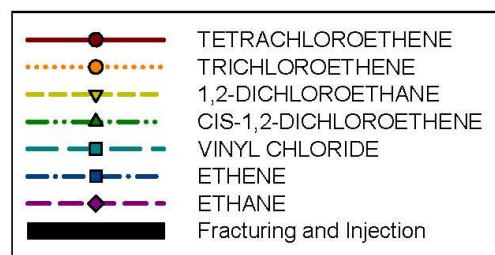
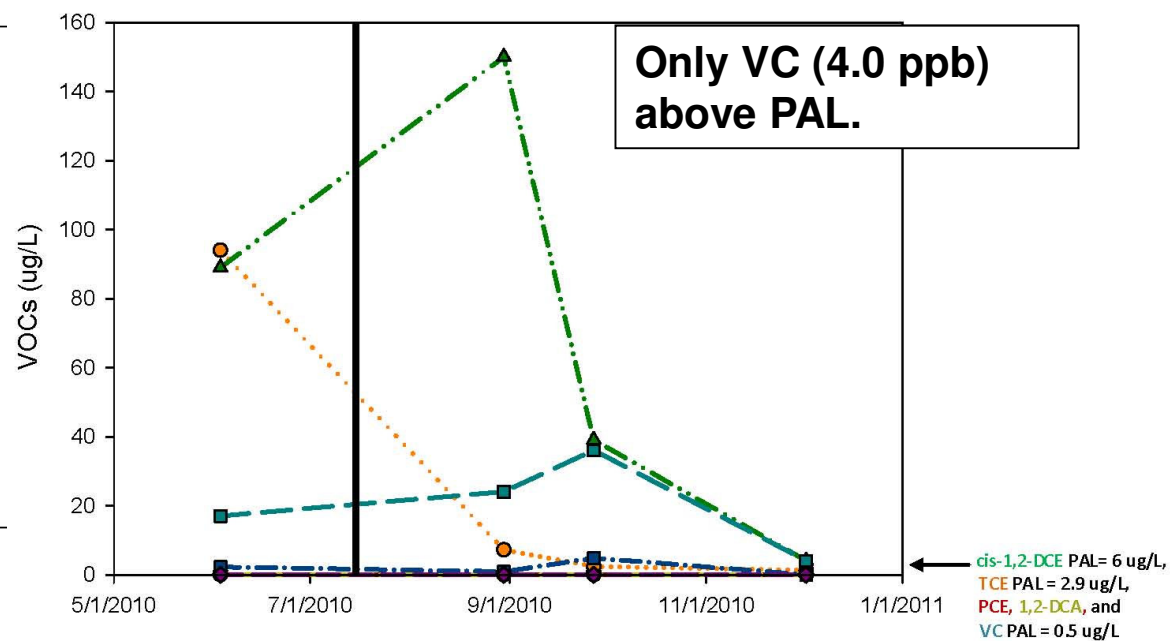
# Chloroethene Degradation: IR25MW16A



IR25MW16A



IR25MW16A





## **TC3: Decision Criteria for Polish**



- 1. The absence of parent compounds (i.e., highly chlorinated benzenes and ethenes) or concentrations below PALs.**
- 2. The presence of reductive daughter products (i.e., benzene, and /or VC) above PALs.**
- 3. No increases in the total molar mass of COCs and reductive daughter products observed in groundwater (increases in total molar mass indicate that contaminant mass is continuing to diffuse/desorb from the aquifer matrix).**



# Decision Criteria Table



Criteria	IR25MW68A	IR25MW11A	IR25MW16A	IR25MW66B	IR25MW67A
<b>1. The absence of parent compounds or concentrations below PALS.</b>	No- 1,4-DCB, 1,2-DCA (close 2.3 ppb), Yes- PCE, 1,2- and 1,3-DCB	No- 1,4-DCB, Yes- PCE, 1,2-DCA, 1,2- and 1,3-DCB	Yes- All	No-1,4-DCB on 12/1 (11 ppb), PCE just above (4.5J) 12/1 and was for other sampling rounds.	Yes-All except, close PCE (<1 ppb)
<b>2. The presence of reductive daughter products (i.e., benzene, and /or VC) above PALS.</b>	Yes-CB (170 ppb), benzene (2.2 ppb), VC (1.8 ppb)	Yes-CB (200 ppb), benzene (2.2 ppb)	No- CB,benzene, Yes - VC (4 ppb)	No	No-CB, benzene, Yes VC (3 ppb)
<b>3. No increases in the total molar mass of COCs and reductive daughter products observed in groundwater.</b>	No	No	No	No	No
<b>Criteria Met?</b> 1. Absence of parent below PALS 2. Presence of daughter above PALS 3.No increase in total COC mass	<b>1-No, 2- Yes, 3- Yes</b>	<b>1- No, 2- Yes, 3- Yes</b>	<b>1- Yes, 2- Yes only VC, 3- Yes</b>	<b>1- Nearly, 2- No, 3- Yes</b>	<b>1- Nearly, 2- Yes only VC (3 ppb) , 3- Yes</b>
<b>Polish?</b>	<b>No- but probable</b>	<b>No- but probable</b>	<b>No- no polish needed</b>	<b>No- no polish needed</b>	<b>No- no polish needed</b>



## Recommendations



- **IR25MW16A, -66B, -67A do not currently need polish.**
- **IR25MW11A and IR25MW68A may need polish, but do not yet meet decision criteria.**
  - **Options:**
    - **Wait for chlorobenzene (CB) and 1,4- DCB to go below PALs and polish with sulfate.**
    - **Conduct a carbon injection to reduce CB, 1,4-DCB and then polish benzene with sulfate.**



# Presentation Roadmap

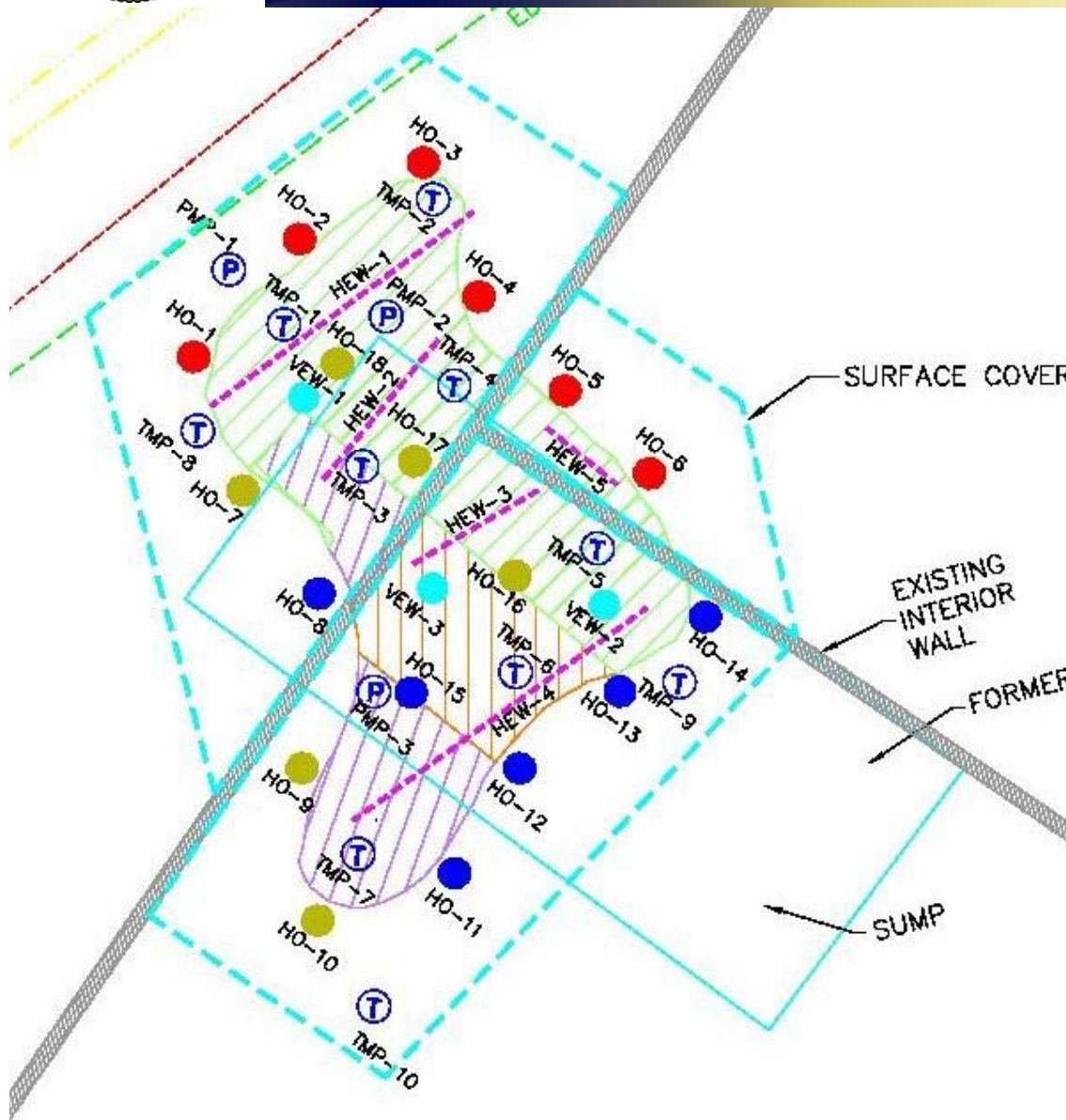


- 1. TC2: Thermal conduction heating in the source area**
  - Review website
  - Details of O&M and Performance Evaluation.





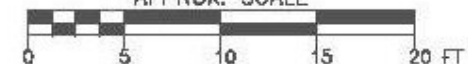
# TC2: TCH Treatment System As-Built



## LEGEND

- (HO-X) SHALLOW ISTD HEATER BORING, BOTTOM OF HEATER: 30' - 31' BGS [6]
- (HO-X) MID ISTD HEATER BORING, BOTTOM OF HEATER: 34.5' - 36' BGS [6]
- (HO-X) DEEP ISTD HEATER BORING, BOTTOM OF HEATER: 37' - 41' BGS [6]
- (VEW-X) VAPOR EXTRACTION WELL [3]  
VEW-1, VEW-2 20FT DEEP  
VEW-3 30FT DEEP
- (HEW-X) HORIZONTAL VAPOR EXTRACTION WELL [65 FT]
- P (PMP-X) PRESSURE MONITORING POINT [3]
- T (TMP-X) TEMPERATURE MONITORING POINT [10]  
TMP-1, TMP-2, TMP-4, TMP-5, TMP-8 26FT DEEP  
TMP-3, TMP-7, TMP-9, TMP-10 31FT DEEP  
TMP-6 36FT DEEP
- TREATMENT AREA BOUNDARY - 25FT DEPTH
- TREATMENT AREA BOUNDARY - 30FT DEPTH
- TREATMENT AREA BOUNDARY - 35FT DEPTH
- SURFACE COVER

APPROX. SCALE





## TC2: Website



The login for the website [www.thinkthermal.com](http://www.thinkthermal.com):

Under the TerraTherm box inputs:

Select "Hunters Point" from the "Site" dropdown menu

Username: RUC5TS

Password (case sensitive): blg134

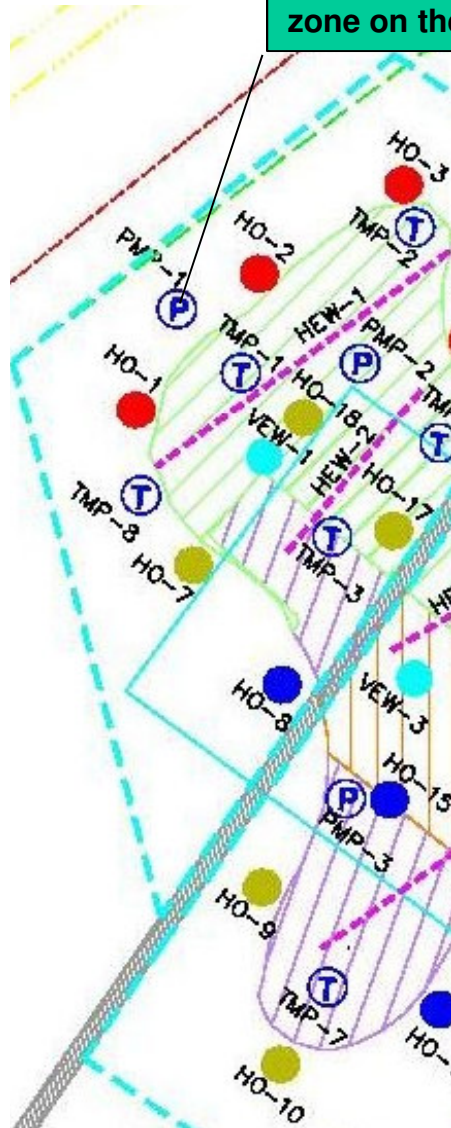
- Updated once/week (usually Tues. morning) with O&M process monitoring data.



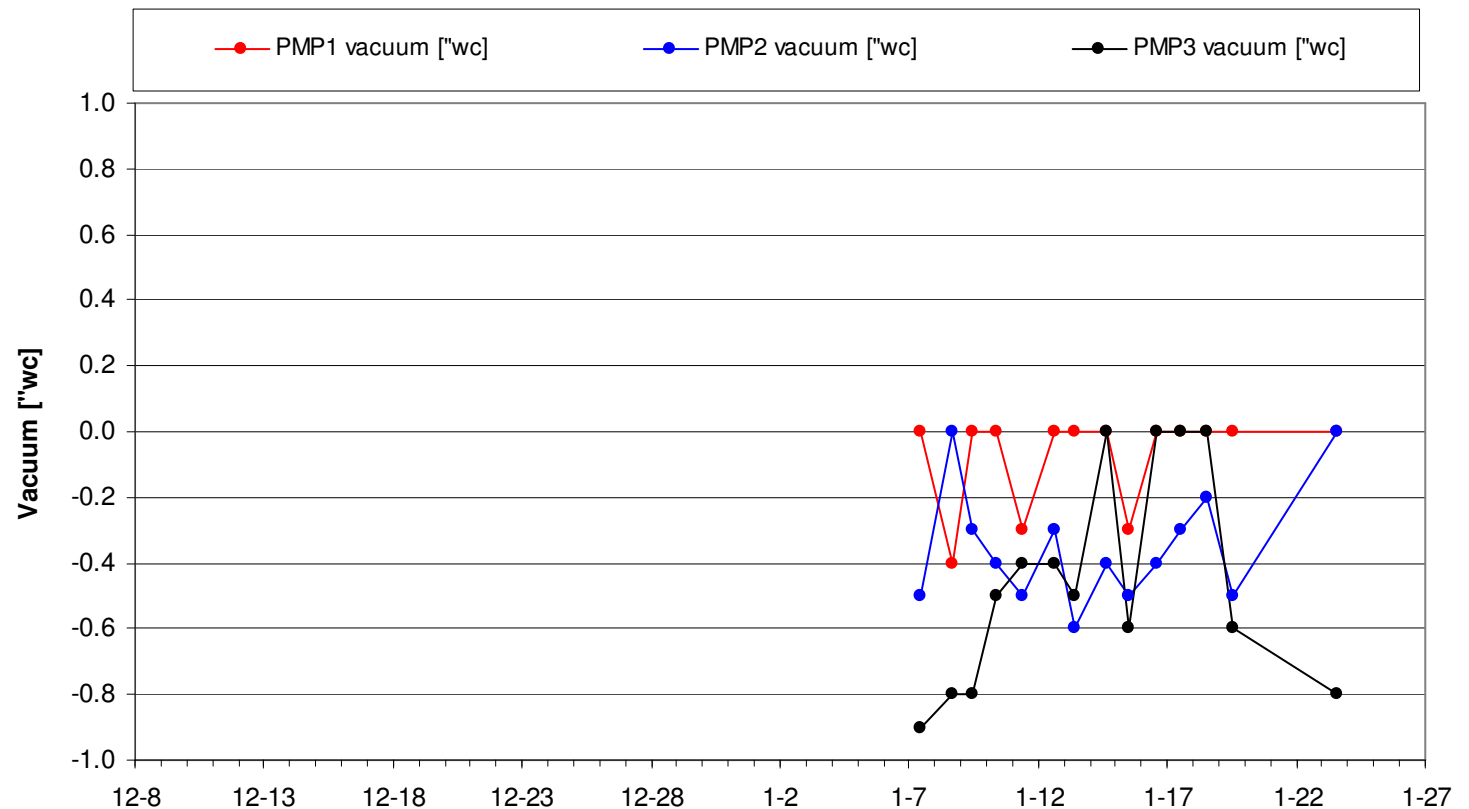
# TC2: Pneumatic Control

PMP well moved outside the treatment zone on the treatment side of the swale

- Move PMP to outside of the treatment boundary to monitor soil gas COC concentrations before and ~1/month during thermal treatment.



Pressure Monitoring Points



Note: Positive numbers are pressure. Negative numbers are vacuum.

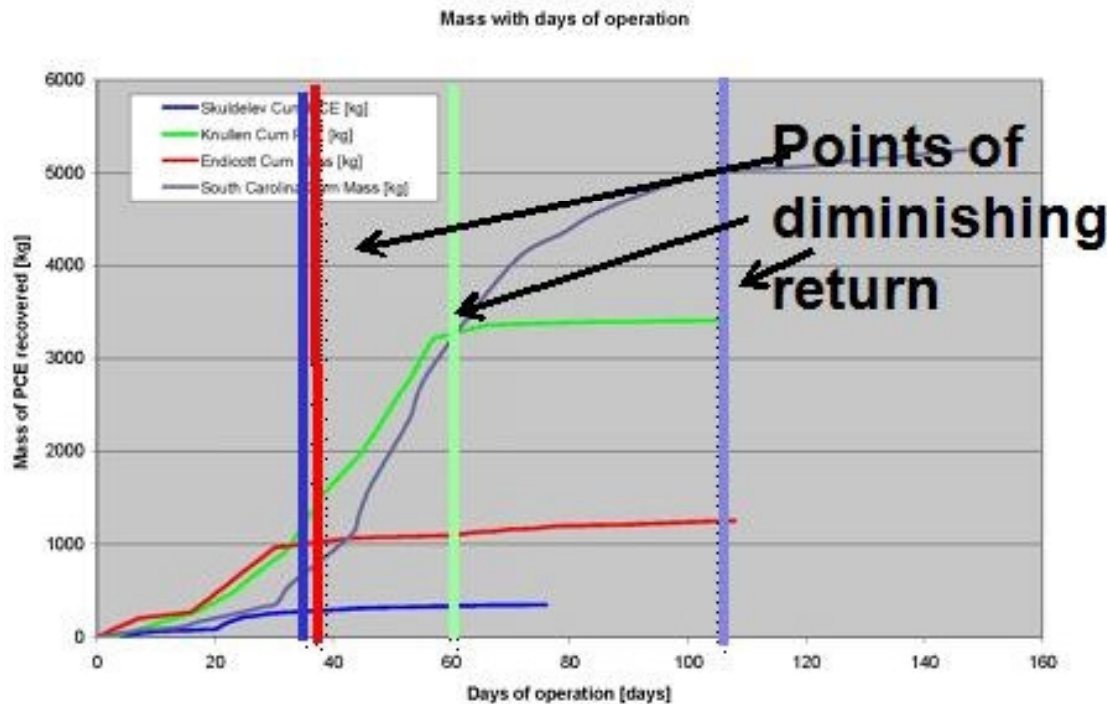


## TC2: Data Evaluation Conceptual



### Typical shape of cumulative mass removal graphs

Typical shape of cumulative mass removal graph. Total days of operation depends on design (heater spacing, water influx) and will look different with different chemicals of concern (and different chemical properties with temperature).



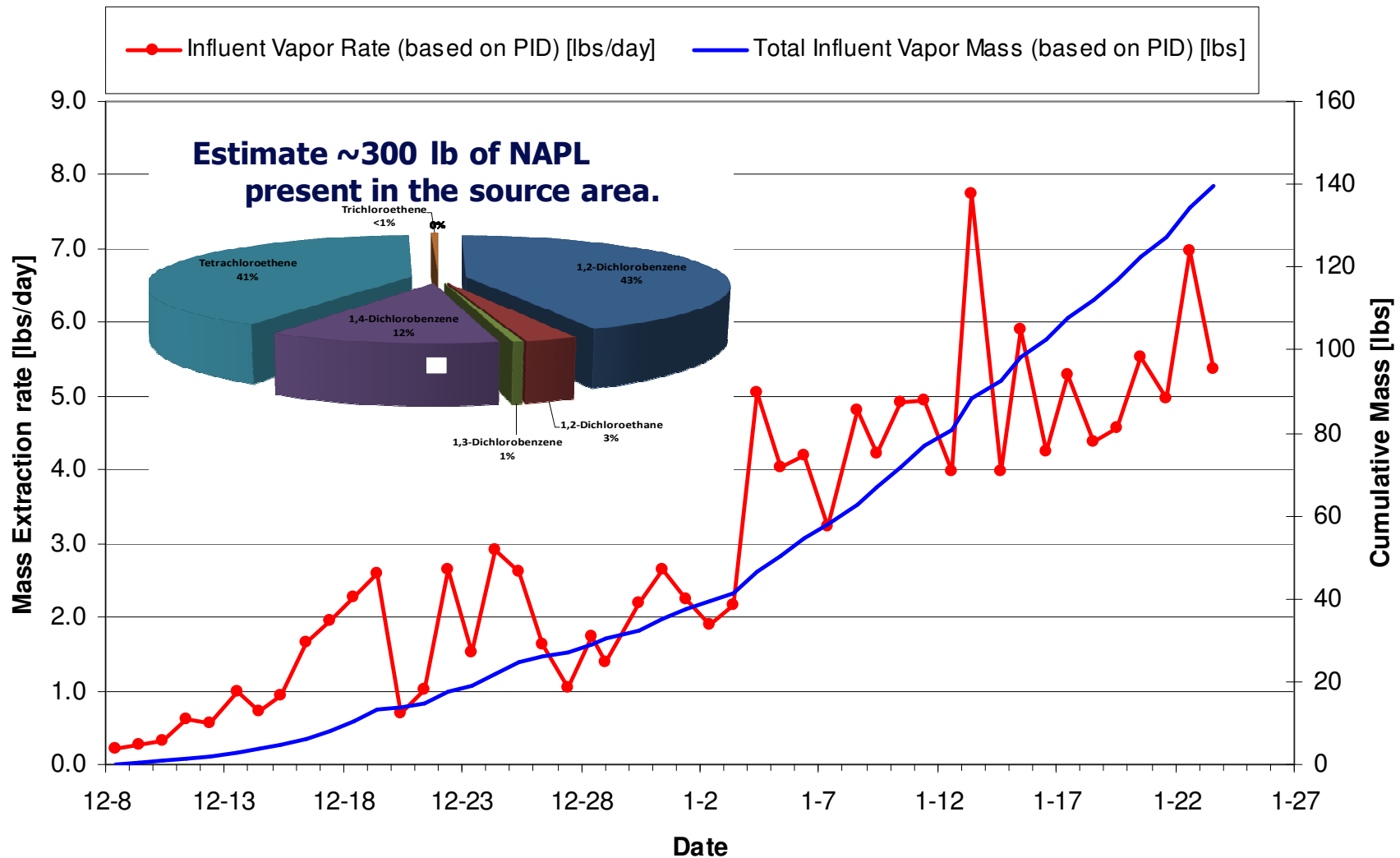
1. Evaluate cumulative mass removed and removal rates over time.
2. Model predicated total mass based on trends.
3. Evaluate point of diminishing return (usually 90-95% of total estimated mass).



# Current Progress at Building 134



## Mass Removal





## Conclusions



- Heating progressing, as planned, current temperatures at/near target treatment temperature (current average is 194F).
- The bottom of the treatment zone is still coming to temperature.
- Have pneumatic control as indicated by zero and sub-zero pressures at PMP-1 compared to PMP-2.
- Extraction rate is in the order of 144 scfm the pore volume at the site is exchanged somewhere between 35 and 40 times a day.
- Removed ~140 lbs of VOC mass based on PID readings.
- Continued operation of the system is warranted.



## Upcoming Events Schedule



- TC3 Polish Strategy: ~ end-Feb. 2011, BCT Meeting
- TC2 and 3 Groundwater Monitoring Event 2: February 14, 2011.
- TC2 decision point: Shutdown, Feb. 2011, Webex or BCT
- TC2 Cooldown: Mar. 9-23, 2011
- TC2 and 3 Post –treatment groundwater, soil gas and soil data collection: Mar. 28- Apr. 5, 2011
- TC2 System Demobilization- May 2011



RU-C5 Building 134 Well field Installation